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Preliminary Analysis of Water Transfer Types

Prepared for:

CALFED Bay-Delta Program
Environmental Water Program Steering Committee
1416 Ninth Street, Suite 1155
Sacramento, CA 95814

Prepared by:

Jones & Stokes
2600 V Street
Sacramento, CA 95818-1914
Contact: Craig Stevens
916/737-3000

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INTRODUCTION

This briefing paper is intended to explore the types of water acquisitions that could be pursued by the Environmental Water Program (EWP) with the intention of defining which would be acceptable and under what conditions. This effort begins with an exploration of the various ways in which water can be made available for transfer. The types of questions to be answered are:

- What are the various ways in which water can be made available for transfer?
- What kinds of concerns or uncertainties are associated with each source of water?
- What are the advantages and disadvantages of each source of water?
- What mitigation is available to offset the disadvantages?

After considering all of these factors, it is expected that the CALFED agencies, in consultation with the EWP work group, will develop a policy regarding the range of water source types that may be considered for EWP acquisitions and the circumstances under which such considerations will take place. The EWP is also coordinating with the CALFED Environmental Water Account (EWA) team, which is addressing the same or similar issues.

A brief overview of California water rights law is provided prior to the discussion of water source types to provide the reader with basic information needed to understand the information presented in this paper. A more detailed discussion of California water rights is presented in Briefing Paper No. 5, Introduction to Water Rights and Water Transfers (April 2001), available at www.calfedewp.org.

OVERVIEW OF WATER RIGHTS

California has a dual system of water rights: riparian and appropriative. Riparian rights are based on ownership of land adjacent to a stream or river and account for about 10% of the rights to use surface water in California (Water Education Foundation 2000). In general, riparian rights are not lost if unused or unquantified. Riparian rights are generally not transferable to other water users, but riparian rights can be dedicated to instream beneficial uses through the California Water Code 1707 process discussed in Briefing Paper No. 5.

The majority of water rights in California are appropriative. An appropriator's right to the water depends on continued use and can be lost if the water associated with the right is not used. Appropriations initiated after 1914 fall under the authority of the State Water Resources Control Board (SWRCB) while water appropriated before 1914 is generally exempt from SWRCB permitting authority. SWRCB permits allowing appropriation may contain binding terms and conditions to protect other water rights holders or the public interest. A post-1914 appropriative right can be revoked or other enforcement actions can be taken if permit conditions are violated. Both the Central Valley Project (CVP) and State Water Project (SWP) are appropriative right holders and permitees of the SWRCB.

Pre-1914 water rights holders are granted more liberties than post-1914 holders and may change place of use, purpose of use, or points of diversion for the purposes of transferring water without approval of the SWRCB. Post-1914 water rights holders must obtain SWRCB approval of any changes in points of diversion, place of use, or purpose of use of their water rights permits or licenses. However, both pre-1914 and post-1914 water rights holders must ensure that other water users are not injured by a transfer; this "no injury" rule, related to changes in water rights, can affect the amount of water available and is also discussed in more detail in Briefing Paper No. 5. Additionally, changes to post-1914 rights must also not have unreasonable effects on fish and wildlife.

Area-of-origin statutes designed to protect counties and watersheds from which the water originates from the export of water outside the region were passed by the California Legislature in 1943. Area-of-origin laws must be taken into account when determining whether other water users are injured.

"New water" is transferable water that was not previously available; accessing new water creates an increase in supply. Examples include water that was formerly not diverted but flowed to the ocean or water conserved from a reduction in agricultural drainage (e.g., lining an irrigation ditch with cement) that would have been lost in a salt sink. (Water Education Foundation 2000.)

"Real water" is water for transfer that is not derived at the expense of any other lawful user. Water stored in a reservoir may constitute real water when refill of the reservoir does not injure someone else. Examples include net water available from not planting and irrigating a crop and water stored in a reservoir that would not have been released but for the transfer. Real water is not necessarily new water, but new water, by definition must be real. (Water Education Foundation 2000.)

"Paper water" is water that, if transferred, would cause injury to another legal user. An example is the sale of water the seller is legally entitled to use under a water service contract—a right that exists on paper—but one not historically used. If another legal user was putting this water to beneficial use, the water transfer would harm that user. Transferred water that otherwise would have been return flow would constitute a sale of paper water because the water being bought is really coming from a user other than the seller. (Water Education Foundation 2000.)

POTENTIAL SOURCES OF WATER

It is important for any buyer of water to know by what means the water is being made available for transfer, as the source of water may provide clues as to the how difficult it will be to determine the amount of water actually available for transfer, impacts the transfer may have, and who may oppose the transfer. The methods by which water may be made available include:

- crop idling, or fallowing agricultural land;

- crop shifting, or changing the type of crops grown, thereby changing the amount of water used to produce the crop;
- substituting groundwater for surface water;
- directly pumping groundwater;
- water conservation;
- releasing excess water stored in reservoirs;
- selling/buying riparian lands and associated riparian water rights; and
- influencing the timing of third-party transfers

Crop Idling

A grower may decide to not plant (idle or fallow) his or her land for a short period of time and sell the water that would normally be used to irrigate that land to a willing buyer. Idling frees up water on a short-term basis; this short-term water could then be made available for acquisition. In order to facilitate such a transfer, the seller would have to demonstrate that he or she will not use the transferred water, and can transfer only the portion of the saved water that would have been consumed. Only changes in the consumptive use of water resulting from crop shifting can be made available for transfer; consumptive use for agricultural uses includes evapotranspiration losses, and losses to an unusable groundwater aquifer or a salt sink.

Advantages and Disadvantages

Crop idling to create water for transfer has several advantages. The amount of water used for a specific crop and area of land can be relatively easily quantified and monitored. Furthermore, idling land that has been irrigated using surface water not only increases instream flows, but also reduces diversions from that stream and the associated effects on instream resources.

Although it is relatively easy to quantify the amount of water used for a specific crop, identifying the quantity of water available for transfer through idling can be difficult because water needs vary from year to year depending on year type (dry versus wet) and general cropping patterns. For example, a single source of water may have been used to irrigate a number of different crops having differing water needs in the recent past. It is also a challenge to quantify the loss of groundwater recharge that would result from crop idling. Rainfall patterns can influence water use directly by affecting the need for irrigation and indirectly by changes in CVP and SWP water allotment, which vary from year to year depending upon the overall water

supply, or changes in legislation or policy. Finally, water made available through crop idling is limited to the consumptive demand of the crop with respect to both the amount of water and timing of irrigation. All of these uncertainties can make it very difficult to quantify the actual amount of water available as a result of crop idling.

Crop idling can also result in disadvantages with respect to potential third-party effects. Idling can result in costs to communities dependent upon the farm economy. Although farmers or landowners receive compensation for selling the water, employees and companies that provide services depending on production from the land will be adversely affected by crop idling. This economic displacement may also adversely affect the local community by increasing the cost of providing social service programs. Crop idling may also increase the purchase price of the water beyond its direct market value as a result of compensation for third-party effects. As these third-party effects may have disproportionately negative impacts on low-income or minority communities such as farm workers, questions of environmental justice may also be raised.

Crop idling may also affect wildlife resources. For example, a farmer who idles a rice field for a season may temporarily eliminate foraging habitat for waterfowl.

Crop Shifting

Water transfers may involve water made available through shifting from production of a water-intensive crop to one that consumes less water. One example would be shifting from tomato production to safflower, which uses less water per acre. As with crop idling, only changes in the consumptive use of water resulting from crop shifting can be made available for transfer.

Advantages and Disadvantages

A prime benefit of crop shifting is that it provides an alternative to crop idling, thereby keeping agricultural lands in production and minimizing the potential third-party effects. However, crop shifting may still present opportunity costs to the agricultural industry depending on market conditions for agricultural commodities. Mitigation may still be required to subsidize farmers for shifting to potentially less profitable crops, and environmental justice concerns may be raised if the new crop requires less labor than the original one. Also, similar to crop idling, it is difficult to quantify the actual amount of water made available through crop shifting.

Groundwater in Lieu of Surface Water

Water may be made available for transfer as a result of a farmer selling water to which he or she has a surface water right and irrigating instead with pumped groundwater.

Advantages and Disadvantages

Substituting groundwater for surface water for agricultural irrigation would benefit instream uses by maintaining water in the source stream and thereby reducing the demand for diversions from the stream. Substituting groundwater may also reduce some third-party effects by maintaining agricultural lands in production.

Although surface and groundwater are treated as separate resources, they can be hydrologically connected. This connection presents a challenge in determining how much of the transferable water is actually new surface water. If transferred surface water is replaced with groundwater that is hydrologically connected to a nearby stream, the surface water supply could be affected. In addition, use of groundwater in lieu of surface water can lead to overdraft if there is excessive pumping of a groundwater basin that is depressed, not replenished, or not recharged, resulting in potentially increased land subsidence, and the potential degradation of groundwater quality.

As of the end of 1999, twelve California counties had enacted groundwater ordinances. Some of these ordinances place restrictions on the use and transfer of groundwater out of the area. For example, Butte, Shasta, and Colusa county ordinances require a permit from the local Board of Supervisors before any groundwater can be exported. Before a permit to export is granted, the proponent of the groundwater export is required to satisfy the Board that the proposed export will not deplete the groundwater supply, degrade water quality, or cause land subsidence. Other California counties are developing or are considering whether to adopt their own groundwater management ordinances.

Some local water management agencies (e.g., cities, water districts, community services districts) have also adopted groundwater management plans. An analysis by the California Department of Water Resources (DWR) indicates that, where they overlap, there is no clear relationship between these local water management plans and county ordinances (Department of Water Resources 1999). Accordingly, groundwater substitution transfers may face complex local regulatory hurdles.

Finally, transfer of a surface water right to the EWP for instream uses may require the transferor to be compensated for the costs of pumping the groundwater he or she intends to substitute for the lost surface water, increasing the cost of the transferred water.

Direct Pumping of Groundwater

Water may be made available for instream uses through the direct pumping and release of groundwater into a stream. The water may either be released into a stream within the same groundwater basin or exported to another area outside of the basin.

Advantages and Disadvantages

Direct diversions of groundwater into surface water supply can pose the same problems as groundwater substitution. Additionally, there are legal and regulatory limitations on out-of-basin groundwater transfers (see Briefing Paper No. 5) and Section 1220 of the California Water Code.

A lack of understanding of the hydrologic, geologic, and engineering factors of using aquifers for water supply can create significant barriers to implementing water transfers that result from groundwater pumping or groundwater substitution. This lack of certainty about aquifer behavior can make groundwater transfers less desirable when reviewing types of potential transfers.

Declining groundwater levels caused by changes in traditional pumping patterns can result in increased groundwater pumping costs and, in extreme cases, the need to drill deeper wells. In some instances, these deeper wells may have poorer quality groundwater.

It can be difficult to establish that a transfer that relies on pumped groundwater or on the use of groundwater in lieu of surface water will have no significant third-party impacts given the uncertainty in future hydrologic conditions, regulatory requirements, and project operations. In addition, groundwater rights are largely determined by case law, unlike surface water rights, which are determined pursuant to the California Water Code. Most basins contain a number of agencies, many of which have different statutory authority, that weigh in on decisions regarding groundwater management. These diversities create a complex environment that requires continuous coordination between agencies to design equitable and workable groundwater management solutions.

In addition to reviewing how the water is made available for transfer, evaluation of potential EWP water purchases must include consideration of legal requirements as outlined in the California Water Code. When the EWP acquires water, it must ensure that the interests of legal users of the water involved, third parties, and fish and wildlife will be protected. The following set of questions will help focus the EWP's decisions regarding the purchase of water made available through groundwater substitution or direct pumping.

- How will the water table respond to increased pumping during and after the transfer period? Domestic wells are often drilled to a shallower depth than agricultural wells. Will increased groundwater pumping cause water levels to decline below existing domestic or agricultural wells?

- Will increased groundwater pumping cause interference with other wells?

- Groundwater substitution transfers typically occur during dry years when natural recharge to the aquifer is low. What is the combined effect on the aquifer of increased pumping and reduced natural recharge?

- How quickly will the water table recover after the transfer period is completed and surface water deliveries are resumed?

- Where are the recharge and discharges areas of the aquifer?

- What are the nature and extent of the hydraulic connection between local rivers and streams and the aquifer? To what extent will increased groundwater pumping reduce surface water flows by either inducing additional seepage from riverbeds to the aquifer or decreasing discharge from the aquifer to the streams?

- What is the quality of water in the aquifer? Will increased pumping induce poor quality water from deeper depths or laterally to migrate into the project areas? Is there a record of historical subsidence?

- Does an infrastructure exist for water users to switch from surface water to groundwater?

- Do a monitoring network and data exist that will allow answers to the technical questions?

- How will a monitoring program and data management system be developed and used?

- Will local water users challenge out-of-basin transfers from "protected areas" as defined by Section 1220 of the California Water Code?

Water Conservation

Adopting techniques or technologies that allow farmers to use water more efficiently may make water available for transfer. Only changes in the consumptive use of water resulting from conservation can be made available for transfer. Conservation measures can include the use of more efficient irrigation equipment or practices, reuse of tailwater (water that collects following irrigation and is returned to a streamcourse), and weed control practices that reduce the consumptive use of water by weeds.

Advantages and Disadvantages

Water conservation can be a cost-effective way to increase the overall supply of water, particularly in comparison with other options for increasing supply such as building dams or diversion facilities. More efficient water management that reduces applied irrigation and drainage outflow can stretch supply and produce new water. However, not all conservation measures produce new water in all geographic locations. For example, conservation measures in the Sacramento Valley may not create new water for transfer if much of the irrigated area

overlies a usable groundwater basin or is part of the drainage water supplied to downstream users. The benefits of conserving water through the lining of irrigation canals are region-specific. Water that leaks from irrigation canals in the Sacramento Valley and much of the San Joaquin Valley provides usable groundwater, feeds wetlands areas, and/or nourishes riparian vegetation.

Stored Water

Water may be made available for transfer from storage in a reservoir where refill of the reservoir does not injure other legal water users. In order to be transferable, it must be demonstrated that, absent this transfer, the water would have remained in storage and would not have been released for another purpose. Refill of the reservoir cannot injure another legal user. The water rights held by DWR and the U.S. Bureau of Reclamation (USBR) allow them to use in the Delta any water released and unclaimed by other users. Therefore, DWR and USBR typically require the seller to demonstrate that he or she will not replace the transferred water by releasing into the reservoir water DWR and USBR would otherwise have had the use of. This demonstration is usually made through the negotiation of reservoir refill criteria, which details post-transfer reservoir operations.

Advantages and Disadvantages

The transfer of stored water has the advantage of not resulting in decreased economic activity and thus not having third-party economic effects. The stored water is typically sold when supplies are greater than the needs of an individual or a district, or when the individual or district is willing to take a risk that the sold supplies will be replenished by future precipitation.

A disadvantage of stored water transfers is that determining refill criteria can be very difficult, given the uncertainty about future hydrological conditions and reservoir operations. Another disadvantage is that stored water in excess of needs is only available on a very few streams in the EWP geographic area.

Purchase of Land with Riparian Water Rights

The EWP could acquire water by purchasing land that has riparian water rights. Water associated with riparian rights can only be used on the land to which the right is attached. In order for water acquired in this manner to be used for instream purposes, the water must be protected pursuant to Section 1707 of the California Water Code.

Advantages and Disadvantages

Administratively, purchasing land with associated riparian rights would be a relatively simple method of acquiring water. The purchase would not require review by the SWRCB or any other entity and would not require an extensive water right administrative process. There would not be restrictions on purpose and time of use of the water.

There are also administrative disadvantages, however. As mentioned above, the acquired water would have to be permanently protected pursuant to Section 1707 if the buyer intends to leave the water instream. The CALFED agencies would have to identify an entity to actually make the purchase in name, and this entity would have to go through the land purchase and ownership process. Because the purchase would be for more than water, the price of the "acquisition" could be unacceptable. The owner would have to address how to use the land, a secondary consideration to use of the water. It may be that the owner could establish a partnership with another entity that would agree to manage the land. The owner would also need to consider how not using the water on the riparian land may affect management of that parcel.

Unlike appropriative water rights, riparian rights are not typically quantified. Although riparian water users must ensure that their extraction does not adversely affect other water users, they are not required to account for the amount of water taken from a stream. Because the amount of water associated with riparian rights is not necessarily quantifiable, it could be difficult to determine the amount of water actually available for use instream.

Influencing the Timing of Third-Party Transfers

Instead of pursuing the purchase of physical sources of water, the EWP may be able to take advantage of using water already acquired through another process to meet program goals and objectives. Instead of pursuing the purchase of physical sources of water, the EWP may be able to influence the timing of the release of water acquired through another process. If a third-party transfer is planned for a high-priority stream, EWP may contribute funds to have the transfer occur during a biologically beneficial period.

Advantages and Disadvantages

An advantage to influencing third-party transfers is the lessening of administrative duties and costs on the part of the EWP. Although influencing these transfers may indeed constitute a partnership, the level at which the EWP is involved in pursuing and acquiring the physical water would be substantially less than if the program pursued the acquisition on its own. Another obvious advantage is that the acquired water could be used to meet multiple objectives. Both CALFED agencies and stakeholders have indicated a desire to see the EWP participate in transfers that achieve multiple objectives or lead to multiple beneficial uses of one water supply.

Disadvantages associated with influencing third-party transfers include the lack of control over the amount of water acquired and released and a limited ability to participate in overall management of the water. Another disadvantage is that the third parties must be able to demonstrate that, absent EWP participation, moving the water during the desired period would impose extra cost or risk on them.

PRELIMINARY MITIGATION STRATEGIES

Both the CALFED EWP and EWA are developing preliminary strategies to mitigate potential adverse effects associated with water acquisitions. The following table lists preliminary measures developed by the EWP. It is expected that both the EWP and EWA strategies will be refined in the coming year; this paper will be updated accordingly.

EWP Measure/Strategy	Transfer Type
• Develop a method to evaluate a proposed transfer's potential effects on operations of the SWP and CVP.	• All Types
• Establish baseline conditions in affected watersheds so that effects of transfers on flow, temperature, and geomorphology can be measured	• All Types
• Develop a method to ensure that the transfer does not injure legal users of water. The plan should include the means to monitor potential effects on other legal users.	• All Types
• Establish limits on crop idling to avoid concentrating third-party impacts in a few areas.	• Crop Idling
• Develop a plan to protect wildlife that may be affected by the change in water distribution associated with crop idling or crop shifting.	• Crop Idling • Crop Shifting
• Develop a plan to compensate local communities for socioeconomic impacts associated with groundwater extraction, crop idling, and crop shifting.	• Crop Idling • Crop Shifting • Groundwater Substitution • Direct Pumping of Groundwater
• Require parties transferring water rights to provide a history of their diversions to demonstrate that they are actually reducing water use.	• Crop Idling • Crop Shifting • Water Conservation • Groundwater Substitution • Direct Pumping of Groundwater
• Work with local agencies to monitor the effect of a reduction in irrigation return flows on local groundwater basins. Develop a plan to respond to evidence of adverse effects.	• Water Conservation • Groundwater Substitution • Direct Pumping of Groundwater
• Do not consider groundwater substitution or direct transfer of groundwater in areas of known land subsidence.	• Groundwater Substitution • Direct Pumping of Groundwater
• Do not consider groundwater substitution or direct	• Groundwater Substitution

EWP Measure/Strategy	Transfer Type
transfer of groundwater in areas of known degraded groundwater quality or in areas vulnerable to groundwater contamination (e.g., adjacent to basins known to be contaminated).	• Direct Pumping of Groundwater
• Do not consider groundwater substitution or direct transfer of groundwater in areas of known groundwater overdraft.	• Groundwater Substitution • Direct Pumping of Groundwater
• Work with local agencies to develop groundwater monitoring protocols and long-term response plans for areas where groundwater substitution or direct transfer of groundwater occurs	• Groundwater Substitution • Direct Pumping of Groundwater
• Coordinate with local groundwater banks and consumptive use programs regarding potential partnerships with the EWP.	• Groundwater Substitution • Direct Pumping of Groundwater
• Focus direct groundwater pumping or water made available through groundwater substitution in adjudicated groundwater basins	• Groundwater Substitution • Direct Pumping of Groundwater
• Work with local agencies to develop a groundwater quality monitoring and response program.	• Groundwater Substitution • Direct Pumping of Groundwater
• In development of the EWP framework, include provisions for the acquisition and use of stored water in years when adequate supply exists. The provisions will include refill criteria considerations.	• Stored Water
• Work with the managers of CVP and SWP operations to ensure that stored water can be released at critical times.	• Stored Water
• Contact CALFED agencies regarding potential ownership and management of acquired water rights. Include discussion regarding potential partnerships and the possibility for multiple uses from acquired riparian properties and riparian rights.	• Acquisition of Riparian Land and Associated Riparian Rights
• Develop a plan to address achievement of multiple goals with potential third-party partners (other programs to which the EWP may be a third party).	• Influencing Third-Party Transfers

CONCLUSION

It is clear that each water source has advantages, disadvantages, and challenges associated with it. Further, none of these sources individually is likely to provide sufficient water for the EWP. The task at hand is to develop a strategy that defines where geographically, under what conditions, and with what limitations or mitigation each source should be used. By using a varied strategy that spreads out impacts geographically and by socioeconomic sector, and through the use of appropriate mitigation, the EWP will develop a successful water acquisition program that meets the needs of local, State, and federal interests.

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